

GOODHARD/GRANT/IN-89-CR

53623
SP.

CAL-1638

INTERNATIONAL ULTRAVIOLET EXPLORER OBSERVING PROGRAM

Ninth Episode

ULTRAVIOLET OBSERVATIONS OF SELECTED ASTRONOMICAL SOURCES

Semiannual Status Report

Grant No. NAG5-823

Submitted by:

The Trustees of Columbia University
in the City of New York
Box 20, Low Memorial Library
New York, New York 10027

Principal Investigator:

Jules Halpern
Assistant Professor of Physics

Period Covered by Report:

July 7, 1986 - December 31, 1986

(NASA-CR-180155) INTERNATIONAL ULTRAVIOLET
EXPLORER OBSERVING PROGRAM: ULTRAVIOLET
OBSERVATIONS OF SELECTED ASTRONOMICAL
SOURCES Semiannual Status Report, 7 Jul. -
31 Dec. 1986 (Columbia Univ.) 5 p CSCL 03A G3/89

N87-17584

Unclas
43766

FEBRUARY 1987

INTERNATIONAL ULTRAVIOLET EXPLORER OBSERVING PROGRAM

Ninth Episode

ULTRAVIOLET OBSERVATIONS OF SELECTED ASTRONOMICAL SOURCES

Semiannual Status Report

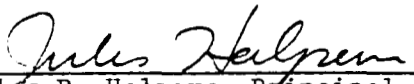
Principal Investigator:

J.P. Halpern
Columbia Astrophysics Laboratory
Columbia University
538 West 120th Street
New York, New York 10027

Submission Date:

January 1987

Endorsed by:


Jules P. Halpern, Principal Investigator
Assistant Professor of Physics
(212) 280-2554

FEBRUARY 1987

Semiannual Status Report

This report describes research in progress on the ninth episode IUE programs listed below. The principal investigator is Jules P. Halpern, and the period covered is 7/1/86 - 12/31/86.

Rapid Variations in the Far-UV Spectrum of the Cool Ap Star 21 Com

(Lead Investigator: R. Monier)

Archival spectra that cover the rotation of the star revealed large variations shortward of 1700 Å with a maximum amplitude of 0.85 mag in the range 1450 - 1550 Å. In order to determine the physical mechanisms responsible for the flux variations, we (Monier and Megessier 1987, submitted to Astronomy and Astrophysics) computed synthetic spectra for the region 1450 - 1510 Å. Iron was found to be the major source of opacity in this spectral region. However, we found that models computed with different iron abundance fail to reproduce the observed variations. More sophisticated models which include variations in effective temperature as well as variations in iron abundance can account for the spectral variations. A positive correlation is seen between the iron abundance and the effective temperature. The increase in iron opacity allows deeper, hotter layers to be seen, an effect which varies smoothly throughout the rotation.

Analysis of the archival spectra of 21 Com also revealed an instance of large amplitude, rapid line variations at wavelengths shorter than 1700 Å. Low resolution spectra display deep, broad absorption lines which come and go in 80 minutes or less. We reobserved 21 Com during 4 shifts in July 1986 to search for further rapid variations in the lines. High resolution spectra were taken using alternately the SWP and LWP cameras (optimum exposure times

were 15-20 minutes). So far we have analyzed the SWP spectra in the 1700-1800 Å range. Broad lines ($v \sin i \approx 70$ km/s) are highly blended. The strongest lines are due to Fe II. Comparison of spectra taken 1 hour apart shows that the intensity and profiles of the Fe II lines vary. In most spectra, the blends are asymmetric with marked blue or red wings. In some spectra, several lines become double. We are currently doing a systematic search for line doubling and shell components to determine the time scale of possible shell ejections.

Elliptical Seyfert Galaxies

(Co-Investigator: R. Monier)

The two shifts devoted to this program took place in July 1986. SWP exposures of Arp 102 B and NGC 6212 were obtained, as was an LWP exposure of Arp 102 B. Very faint continuum emission was detected in each case. The only emission lines visible are the narrow components of Lyman α . Analysis is underway to determine whether the continuum is stellar or nonthermal, since the continuum is predominantly stellar in the visible. The Ly α lines will be compared with the narrow components of the Balmer lines to test models for the photoionization of the narrow-line region. This will be difficult in the case of Arp 102 B because of a radiation event, which hit directly on the line.

Simultaneous optical spectroscopy of both galaxies was obtained at Lick Observatory. Continuing optical spectroscopy will be used to search for changes in the Balmer line profiles of Arp 102B which would be indicative of a binary broad-line region.

Variations of Cool Ap Stars with Strong Magnetic Fields

(Lead Investigator: R. Monier)

The observations for this ninth year program have not been carried out yet. Spectra covering the rotational cycles of two Ap stars, 53 Cam and 78 Vir, will be obtained in May 1987.

X-Ray Selected BL Lac Objects

(Co-Investigator: J. Patterson)

Two out of the three shifts allocated to this program were carried out in December, 1986. Each shift was devoted entirely to a long SWP exposure. Both 0414+009 and 1415+259 were detected in the continuum. No emission lines were detected, confirming the BL Lac nature of these objects. This result is especially important in the case of 0414+009 since the published optical spectrum has very small wavelength coverage, and optical polarization has not yet been measured. We also obtained an optical spectrum of 0414+009 at Lick Observatory in Oct. 1986, which greatly extends the wavelength coverage. No LWP exposures were obtained due to time constraints. The final shift for this program will take place in March 1987, and will be used to observe the third BL Lac on the list, 1101-232.